



KU MEDICAL CENTER

ORR-MAJOR SURGICAL SKILLS AND ANATOMY LABORATORY RENOVATION

DATE: 03.01.2018



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COST & SCHEDULE SUMMARY

The cost and schedule summaries below are based on information gathered from multiple on-site meetings and historical data for teaching laboratories, additions and renovations. Considerations have been made for location, however, the project costs below have not been adjusted for inflation beyond a first quarter of 2018 construction start. The project costs represented are inclusive of all design and construction costs, equipment, audio visual, and soft cost allowances. Total project schedule times shown include design, bidding, construction startup, construction and occupancy. Differences in complexity and scale for each scenario result in the various timelines shown.

Project Budget

Anatomy/Surgical Skills Lab - Orr Major - 4th Floor

Two scenarios for construction are represented in the following estimate. Both scenarios plan for locating air handling equipment for the 4th floor in a mechanical penthouse on the roof of Orr-Major. Scenario 1 includes the afore mentioned penthouse and the Anatomy Laboratory. Scenario 2 includes the afore mentioned penthouse with both the Anatomy and Surgical Skills Laboratories. Scenario 1 is 6160 SF and scenario 2 is 11,300 SF program square feet. Gross square feet for both scenarios is 18,485 SF

		Scenario 1	Scenario 2
1.	<u>Project Costs</u>		
	Construction Contract	\$4,677,200	\$6,719,900
	Construction Contingency	\$467,700	\$672,000
	Soft Costs	\$701,600	\$1,007,900
	AV	\$500,000	\$750,000
	Construction Total	\$6,346,500	\$9,149,800
2	<u>OFPM-DCC (State) Fee</u> (1% Fee of const. total to review drawings and provide inspections)	\$63,465	\$91,498
3	<u>FM Contingency</u> (10% of construction)	\$634,650	\$914,980
4	<u>KUMC (FM Project Management Fee)</u> (3% Fee of project total to manage project)	\$209,435	\$301,943
	PROJECT BUDGET TOTAL	\$7,254,050	\$10,458,221

PROJECT DESCRIPTION

This study has been initiated for the purpose of providing state-of-the-art teaching laboratory space for surgical skills and anatomy training. Existing surgical skills laboratory space is spread throughout multiple buildings and is not conducive to the shared resource model represented in this study. Existing anatomy laboratory space is past it’s usable life span and does not provide adequate ventilation for students and professors within the space. The existing anatomy laboratories are made up of multiple smaller space that are not conducive to the large classroom environment that is desired.

Three options for construction are represented in the following study that outline multiple ways to achieve a first phase of renovation for Orr-Major. Each option suggest locating air handling equipment for the 4th Floor program spaces in a mechanical penthouse on the roof of Orr-Major. This approach will free up much needed space within the building for teaching and demonstration. The mechanical penthouse has been located to best utilize the existing concrete frame of Orr-Major and directs load to structural bays that can support the additional loading of a new steel frame and mechanical air handling units. A summary cost analysis for each option is provided on the previous page and a detailed breakout for each option is provided in section 4.

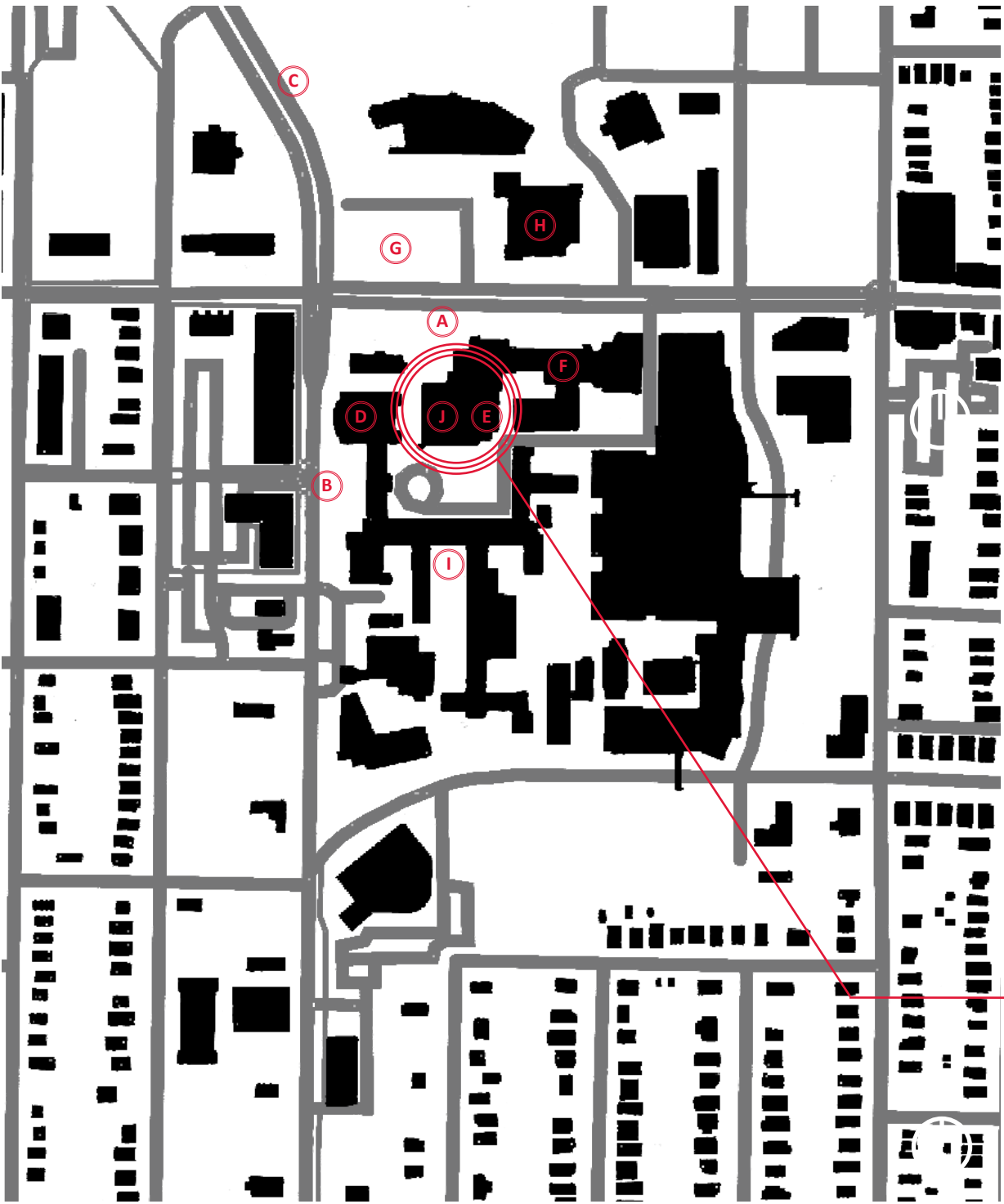
On site tours and multiple user review meetings were conducted during the course of this study in order to determine the types, quantity and quality of spaces required as well as the appropriate number of students and faculty to plan for now and in the future. The Proposed Surgical Skills and Anatomy spaces have been planned to promote flexibility in class size as well as technology utilization. Movable wall systems are shown that allow Surgical Skills to be sub-divided into as many as six spaces that function independently from one another. The Anatomy Laboratory is sub-dividable into three different spaces that are configured with identical functionality. Each of the student stations have overhead boom systems for high quality lighting as well as specific audio visual and equipment requirements. These types of space considerations will greatly increase the schedule-ability of 4th Floor Orr-Major as well as allow outside organizations to utilize the space for a variety of teaching activities. Furthermore, support space for each teaching laboratory has been included on the 4th floor immediately adjacent to the laboratories. Additional support space for briefing and debriefing has been accounted for and is shown as an optional 3rd Floor renovation.



Westfall Drive Aerial View

Quarterdeck Aerial View

PROJECT LOCATION



SITE KEYPLAN

- A. W 39th Ave
- B. Rainbow Blvd
- C. Hwy 169
- D. School of Nursing
- E. Hixon
- F. Wahl
- G. Health Education Building
- H. Dykes
- I. Delp
- J. Orr-Major

Project Location

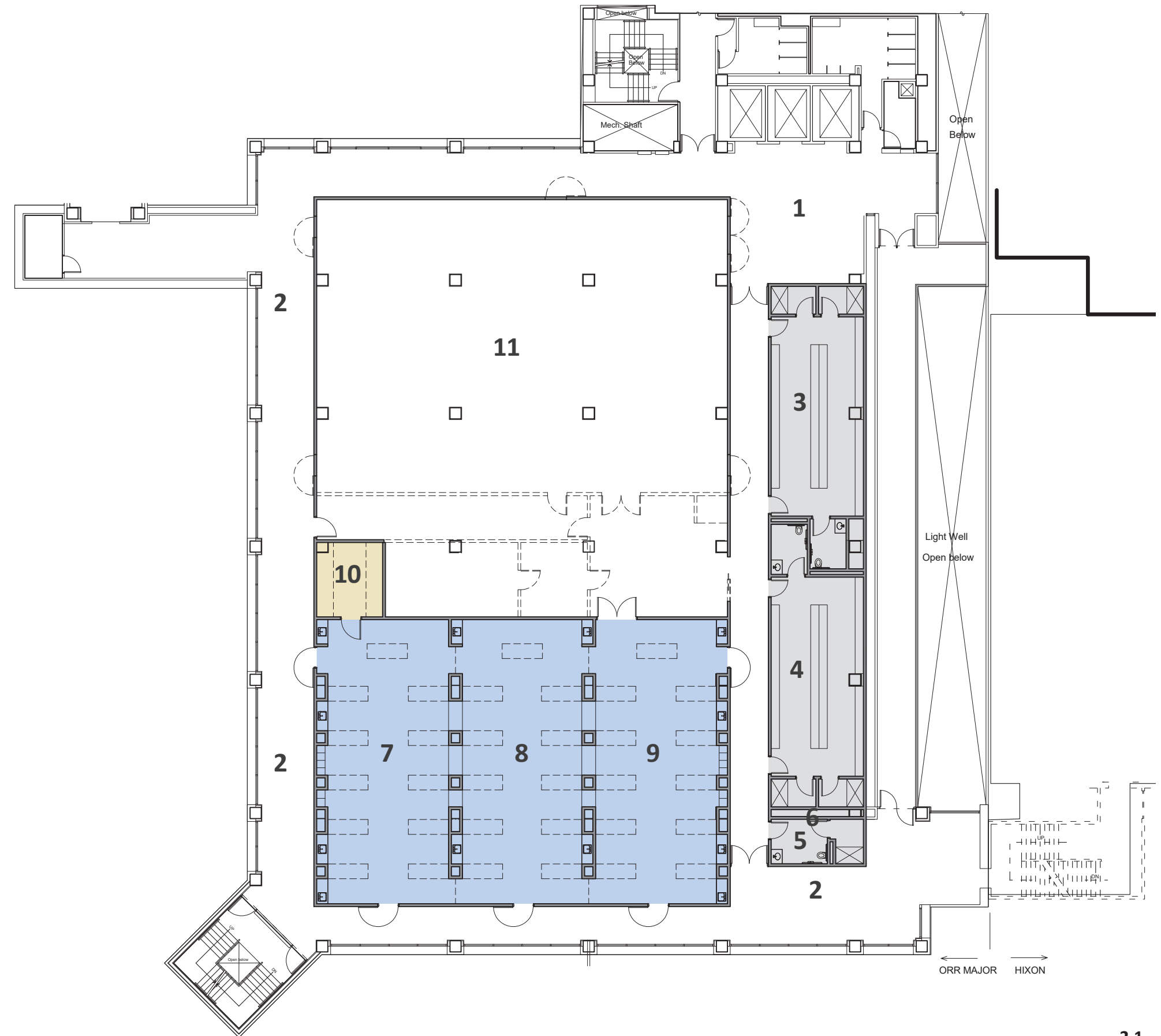


SCENARIO 1

FOURTH FLOOR ANATOMY PLAN

1" = 20'-0"

- 1 Check-In
- 2 Informal Debrief
- 3 Men's Locker
- 4 Women's Locker
- 5 Unisex Restroom
- 6 Laundry
- 7 Anatomy A
- 8 Anatomy B
- 9 Anatomy C
- 10 Cold Storage
- 11 Future Surgical Skills



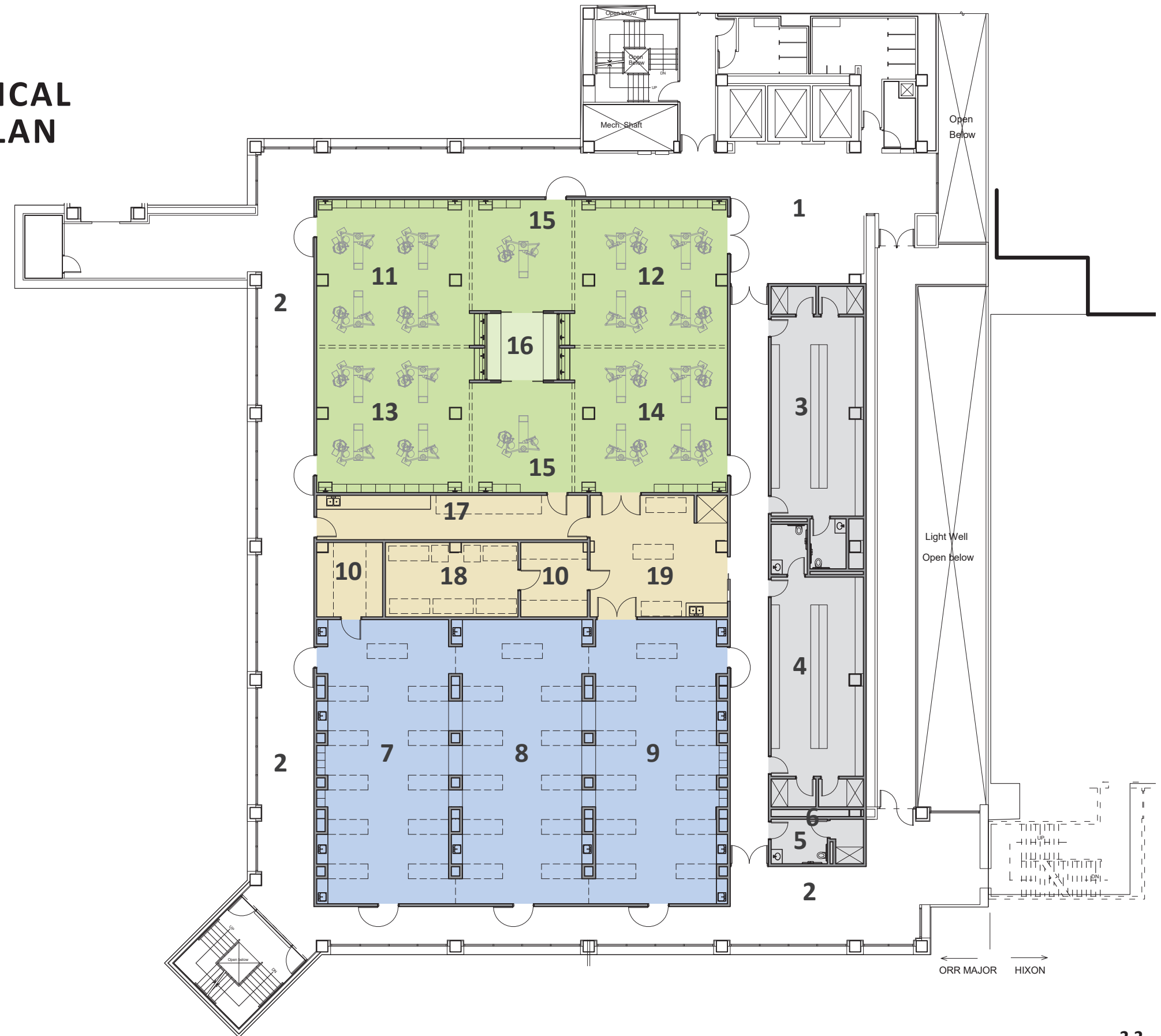


SCENARIO 2

FOURTH FLOOR SURGICAL SKILLS & ANATOMY PLAN

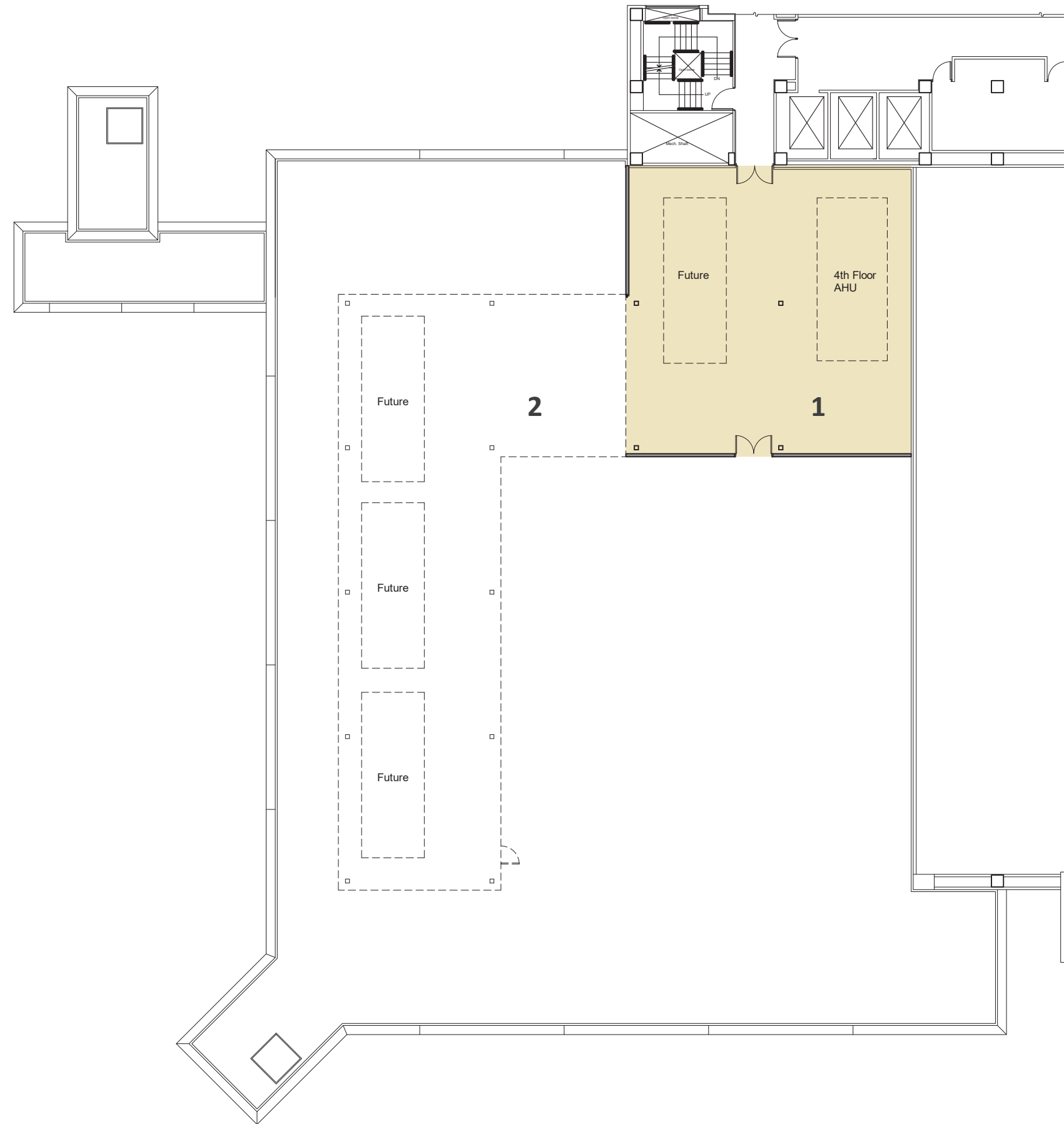
1" = 20'-0"

- 1 Check-In
- 2 Informal Debrief
- 3 Men's Locker
- 4 Women's Locker
- 5 Unisex Restroom
- 6 Laundry
- 7 Anatomy A
- 8 Anatomy B
- 9 Anatomy C
- 10 Cold Storage
- 11 Surgical Skills A
- 12 Surgical Skills B
- 13 Surgical Skills C
- 14 Surgical Skills D
- 15 Hybrid OR
- 16 Control RM
- 17 Sterilization
- 18 Freezer
- 19 Tissue Prep



SCENARIO 1 & 2
PENTHOUSE PLAN
 1" = 20'-0"

- 1 Penthouse (scenario 1 & 2)
- 2 Future Penthouse



ANATOMY LABORATORY PERSPECTIVE VIEW



ANATOMY LABORATORY PERSPECTIVE VIEW





SURGICAL SKILLS LABORATORY PERSPECTIVE VIEW



2.7

HYBRID OPERATING ROOM PERSPECTIVE VIEW



SURGICAL SKILLS LABORATORY PERSPECTIVE VIEW



STRUCTURAL NARRATIVE

Structural Narrative

General Requirements

The structural analysis for this study is based on the following criteria:

- IBC 2012, International Building Code 2012
- ASCE 7-10, American Society of Civil Engineers – Minimum Design Loads For Buildings And Other Structures
- ACI 318-11, American Concrete Institute – Building Code Requirements for Structural Concrete
- AISC 360-10, American Institute of Steel Construction – Specification for Structural Steel Buildings

Design Loads

The design loads applied in the structural analysis are as follows:

- A. Dead Loads:

=

Self Weight of Framing plus any Superimposed Dead Loads
- B. Live Load: design live loads are not shown on the original drawings. The loads shown here were used for the preliminary analysis of this study. Lower live loads following the occupancy or use of each area per the IBC 2012 may be used in final design.

1) Elevated Stairs

=

100 psf

2) All Floors

=

125 psf

3) Concrete Framed Roofs

=

125 psf

4) Steel Framed Roofs

=

30 psf

C. Wind Loads from IBC 2012 and Chapter 26 of ASCE 7-10

Exposure Category

=

B

Basic Wind Speed, V

=

120 mph

D. Snow Loads from IBC 2012 and Chapter 7 ASCE 7-10

STRUCTURAL, MECHANICAL, ELECTRICAL, AND PLUMBING DESIGN

Importance Factor

=

1.10

Ground Snow Load, Pg

=

20 psf

Minimum Roof Snow Load

=

22 psf

Thermal Factor, Ct

=

1.0

Exposure Factor, Ce

=

1.0

E. Seismic Loads from IBC 2012 and Chapters 11& 12 of ASCE 7-10

Importance Factor

=

1.25

SS (Short Period Response Acceleration)

=

0.112

S1 (1 Second Period Response Acceleration)

=

0.064

Site Classification

=

D (per 11.4.2 of IBC 2012)

Seismic Occupancy Category

=

III

Seismic Design Category (Short Period Response)

=

A

Seismic Design Category (1 Second Response)

=

B

Existing Foundations

The current foundations bear on shallow bedrock with an allowable bearing capacities of 20 ksf & 60 ksf, depending on location, per the original drawings. The strength and bearing capacity of the current spread and continuous footings are believed adequate for the additional loads created by the proposed penthouse.

Structural Systems

Existing Framing

The existing 5 story building is primarily framed with square cast-in-place concrete columns supporting an 8 1/2” thick cast-in-place two-way flat slab at every floor, including the roof. Integral cast-in-place concrete beams are also framed around the perimeter of each floor. Load bearing cast-in-place walls surround most stair ways, as well as, numerous locations within the lower levels.

The first floor frames over a large auditorium using cast-in-place tapered post-tensioned beams in a crisscrossing pattern. This web acts as transfer beams supporting 4 – four story columns. These beams were not analyzed in full-depth as part of this study, but

preliminary results show the columns above have little excess capacity due to high moments at their base. It is recommended that adding loads to these columns is avoided unless a full comprehensive analysis shows sufficient capacity exists and floor deflection will not be high. For this reason, it is recommended the proposed penthouse does not reside between grids 4 & 7 between grids C & F.

In this study, the roof slab is believed sufficient to support a penthouse floor due to its similarity to other floor slabs within the building, including those below existing mechanical rooms. Attention should be paid to the placement of mechanical units on the floor; such heavy point loads can easily overload flat slab floors. If final mechanical unit selections exceed the floors capacity, other options may be considered, such as over-framing exterior portions of roof, reinforcing the existing slab by adding steel beams from column-to-column below or supporting units with the new penthouse roof. The roof slab should be analyzed in full for the addition of penthouse mechanical equipment weights, wall weights and snow drift weights during the final design.

Proposed Penthouse Framing

The new penthouse may be framed with conventional steel tube or wide flange columns and wide flange beams. The columns shall sit directly above concrete columns and shall be anchored into the floor with post-installed concrete anchors. The roof may utilize open web steel joists between beams with 1 1/2” steel decking above. Additional framing shall be included as necessary to support roof top loads.

Lateral Load Resisting System

The lateral load resisting system in this analysis was assumed to include ordinary reinforced concrete moment frames and ordinary reinforced concrete shear walls. This combined system transfers lateral loads collected by the slab diaphragms downwards to the ground. Most of the lateral loads are transferred to the surrounding soil by below grade basement walls.

The new penthouse may use steel ordinary concentrically braced frames to transmit lateral forces to the existing roof diaphragm. It is believed in this study the existing structure can accommodate the additional lateral loads of the proposed penthouse and equipment.

3.1

KUMC MEDICAL CENTER
The University of Kansas

The Clark Enersen Partners
Science & Research Design Group

KUMC / ORR MAJOR SURGICAL SKILLS AND ANATOMY LABORATORY RENOVATION
TCEP Project Number: 889-016-17

MECHANICAL NARRATIVE

Mechanical Narrative

GENERAL REQUIREMENTS

The mechanical design for this project will include the following:

- Air handling systems
- Exhaust systems
- Heat recovery systems
- Supply and exhaust air distribution systems
- Chilled water system
- Steam and condensate system
- Heating hot water system
- Energy management and control system (EMCS)
- Plumbing systems

The design and installation of all mechanical systems will be in accordance with relevant portions of the following codes, standards, and publications:

- University of Kansas Medical Center Design Standards
- 2012 International Building Code (IBC)
- 2012 International Energy Conservation Code
- ASHRAE Standard 90.1-2013
- 2012 International Mechanical Code
- 2012 International Plumbing Code
- American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) Handbooks and Standards
- American National Standards Institute (ANSI) Standards
- National Fire Protection Association (NFPA) Codes
- Americans with Disabilities Act Accessibility Guidelines (ADAAG)
- 2008 National Institutes of Health (NIH) Design Requirements Manual (as applicable)

The following temperature, ventilation, and noise parameters will be used as the basis for the design of the building HVAC systems:

- Outdoor Design Conditions*
 - Winter Dry Bulb Temperature: -10 Deg. F
 - Summer Dry Bulb Temperature: -95.8 Deg. F
 - Summer Coincident Wet Bulb Temperature: -76.8 Deg. F

STRUCTURAL, MECHANICAL, ELECTRICAL, AND PLUMBING DESIGN

* As noted in KUMC Design Standards

- Indoor Design Conditions:
 - Winter Dry Bulb Temperature:
 - Laboratory areas 72 Deg. F
 - Laboratory support areas 72 Deg. F
 - Anatomy Laboratory 66 Deg. F
 - Anatomy Prep 66 Deg. F
 - Surgical Skills 66 Deg. F
 - Tissue Prep 66 Deg. F
 - Debrief/general use areas 72 Deg. F
 - Mechanical areas 65 Deg. F
 - All other areas: 72 Deg. F
 - Summer Dry Bulb Temperature:
 - Laboratory areas 74 Deg. F
 - Laboratory support areas 74 Deg. F
 - Anatomy Laboratory 68 Deg. F
 - Anatomy Prep 68 Deg. F
 - Surgical Skills 68 Deg. F
 - Tissue Prep 68 Deg. F
 - Debrief/general use areas 74 Deg. F
 - Mechanical areas 85 Deg. F
 - All other areas: 74 Deg. F
 - Winter/Summer Relative Humidity:
 - Non-laboratory areas 20-60% RH
 - Laboratory areas 30-55% RH
- Minimum Ventilation Rates:
 - Laboratory and lab support areas per ASHRAE requirements
 - Anatomy Laboratory 20ACH (Occ.), 10ACH (Unocc.)
 - Anatomy Prep 20ACH (Occ.), 10ACH (Unocc.)
 - Surgical Skills 20ACH (Occ.), 10ACH (Unocc.)
 - Tissue Prep 20ACH (Occ.), 10ACH (Unocc.)
 - Debrief/general use areas per ASHRAE requirements
 - Mechanical areas per ASHRAE requirements
 - All other areas per ASHRAE requirements

MECHANICAL SYSTEMS

Air Handling Systems

The fourth spaces to be renovated are currently served by a built-up recirculating air handling unit (AHU) located in the third floor mechanical room that will be demolished and replaced with a new AHU that will be installed in a new penthouse. The new AHU will be sized to serve all of the fourth floor spaces. Proper maintenance and access clearances will be provided around the air handling unit. The new AHU will be a 100% outside air modular-type AHU. The laboratory AHU will operate in a variable air volume (VAV) mode although maintaining ventilation rates noted above will limit the amount of airflow modulation. The components of the AHU will be as follows (listed in direction of airflow):

Component	Comments
• Air mixing section w/access door	Low-leak airfoil outside air dampers / 2" MERV 8 pre-filter bank
• Filter section w/ access door	12" MERV 15, 95% efficient cartridge filters
• Heat recovery coil bank	Water coils (with 40% propylene glycol/ 60% water for freeze protection)
• Access section w/ door	
• Heating coil bank	Steam coils, Integral Face and Bypass
• Access section w/ door	
• Humidifier dispersion grid	Steam-fed grid with low absorption distance
• Supply fan	Airfoil fans with vibration isolation pads, fan speed controlled by variable frequency drives (VFD)
• Access section w/ door	
• Cooling coil bank	Chilled water coils with double-sloped drain pan
• Sound attenuator	As required
• Discharge Plenum	

The AHU walls will be double-wall construction with internal insulation. Access sections and internal AHU lights will be provided for ease of maintenance upstream/downstream of each coil.

MECHANICAL NARRATIVE, CONT.

Exhaust System

A new exhaust fan sized for 100% of the maximum zone load will be installed on the roof to serve the renovated spaces. ASHRAE required distances from fresh air entrances will be preserved with the final location of the exhaust fan system. A mixed flow high plume exhaust fan system may be utilized to increase the effective exhaust air stack height to eliminate the potential of polluted air entrainment in other outdoor air openings around campus.

Heat Recovery System

A run-around heat recovery loop will be implemented to recover waste heat from the lab exhaust airstream and transfer into the fresh air supplied to the AHU. A pre-fabricated heat recovery plenum will be installed with the new exhaust fan, consisting of a MERV 8 filter bank followed by a heat recovery coil bank. The coils would utilize a 40% glycol / 60% water solution as the heat transfer fluid. A pump located within the new penthouse will circulate the fluid between the exhaust heat recovery coils and the AHU heat recovery coils noted in the “Air Handling Systems” section above. Anticipated summer and winter effectiveness is approximately 50%. Additional hydronic closed loop components (i.e. expansion tank, air separator, glycol feeder, etc.) will also be installed in the new penthouse.

Supply and Exhaust Air Distribution Systems

All of the existing supply, return, and exhaust distribution systems including ductwork, air terminal units, diffusers, registers, and grilles will be demolished and replaced with a new variable air volume (VAV) air distribution system. With this system type, each temperature control zone will be served by a supply VAV box with an integral hot water reheat coil. The VAV box will modulate its damper position to maintain the required airflow (for code-required airflow and temperature control) as system pressure fluctuates. A heating water 2-way control valve will modulate water flow to the reheat coil to maintain desired zone temperature conditions.

The exhaust system will operate in a VAV mode similar to the supply air system. Each temperature zone will be served by an exhaust VAV box that will “track” the airflow of the corresponding zone supply VAV box to ensure proper space pressurization relationships are maintained. Low wall exhaust grilles will be installed to minimize airflow short circuiting and differing temperature gradients due to stratification.

Occupancy sensors will be installed in the some spaces, such as the Debrief rooms and

other general spaces to monitor occupancy and reduce the airflow to the space if the room is unoccupied for a preset, adjustable time period.

Chilled Water System

New chilled water piping will be connected to the existing 6” supply and return risers on the 3rd floor. Further analysis will be required in the design phases to ensure that adequate pump pressure is available to support the new chilled water load and friction loss on the new AHU.

Steam and Condensate

Steam and steam condensate services from the third floor will be extended to the new penthouse to support the preheat coil and humidification grid in the new air handling unit on the roof.

Heating Water Systems (Reheat and Perimeter Heat)

The existing heating water piping on the fourth floor will be demolished back to the risers on the third floor. New 2-1/2” heating water supply and return piping will be routed up to the fourth floor to serve VAV boxes, terminal reheat coils, and perimeter heating panels.

Energy Management Control System

New direct digital controls (DDC) will be installed in this renovation for the proposed mechanical applications and integrated into the existing building management system (BMS). These applications include: the new AHU, exhaust fan(s), terminal units, laboratory ventilation controls, and hydronic controls for the chilled water, heating water, steam/steam condensate, and heat recovery water systems.

New demand controlled ventilation (DCV) strategies should be considered for the Anatomy and Surgical Skills laboratories to modulate ventilation rates based on occupancy and VOCs present within the space.

PLUMBING SYSTEMS

Storm Drainage Systems

With the addition of a penthouse, the storm drainage systems will be modified to

accommodate the changes of roof drainage. New roof drains and overflow drains will be installed on the penthouse roof and routed to existing risers on the fourth floor. Existing piping on the fourth floor may need to be re-routed to accommodate new ductwork and piping as well as architectural changes.

Sanitary / Laboratory Drainage and Venting Systems

Acid waste/vent piping is currently used to support all of the existing laboratory equipment, sinks, and floor drains throughout the facility. All laboratory waste piping is manifolded into a common main and then discharged outside the building into the sanitary sewer main. Further discussion during the design phase, between users groups, KUMC Facilities group, and the design team will need to be had in to determine if an acid-resistant piping material will be required for laboratory sinks, floor drains, and equipment.

Domestic Water Systems

Domestic (potable) hot and cold water piping is used throughout the existing laboratory spaces to supply laboratory sinks and equipment. Existing piping will be reused and extended to new laboratory sinks and equipment. All laboratory sinks that will be used for purposes other than hand washing will be outfitted with an integral vacuum breaker complying with ASSE Standard 1001. Water piping connected to laboratory equipment will be outfitted with code-compliant backflow prevention where integral means are not included.

ELECTRICAL NARRATIVE

Electrical Narrative

GENERAL REQUIREMENTS

The electrical design for this project will include the following:

- Electrical distribution systems throughout portions of the fourth floor being renovated and new mechanical penthouse.
- Lighting systems throughout portions of fourth floor being renovated and new mechanical penthouse.
- Receptacle layouts to support laboratory equipment and general-purpose needs throughout the areas of renovation.
- Outlet boxes and raceway distribution systems to support voice, data and AV needs throughout the areas of renovation.
- Necessary electrical service to HVAC equipment.
- Electrical to support access control systems, video surveillance security systems and any other special systems.
- Expansion of the existing fire alarm system throughout the area of renovation.
- Special systems as required by laboratory personnel to support necessary laboratory functions.
- Energy saving technologies that are cost effective and approved by the Owner will be implemented in the design. These technologies included, but may not be limited to, occupancy/vacancy sensors, local room controllers, dimming and daylighting systems. LED fixtures will be used throughout the majority of spaces.

The design and installation of all electrical systems and devices will be in accordance with relative portions of the following codes, standards, and publications:

- University of Kansas Medical Center Design Standards
- National Electrical Code; NFPA 70 - 2014
- National Fire Alarm Code: NFPA 72 – 2013
- Life Safety Code: NFPA 101 – 2012
- Emergency and Standby Power Systems Code: NFPA 110 – 2013
- The International Building Code (IBC) – 2012
- International Fire Code: IFC - 2012
- International Energy Conservation Code (IECC) – 2012 or ASHRAE 90.1 – 2013
- Kansas Fire Prevention Code
- Americans with Disabilities Act Accessibility Guidelines (ADAAG) - 2010
- American National Standards Institute (ANSI) Standards
- National Electrical Safety Code (NESC)

STRUCTURAL, MECHANICAL, ELECTRICAL, AND PLUMBING DESIGN

- National Electrical Manufacturer’s Association (NEMA) Standards
- Underwriter’s Laboratories, Inc. (UL)
- Illuminating Engineering Society (IES) Lighting Handbook

Electrical Distribution System

The existing electrical distribution system will be modified as necessary to serve the fourth floor and new mechanical penthouse. Existing branch circuit panels within the areas of renovation will be removed and replaced. New panelboards will be provided to expand the distribution system throughout the renovated area. In general, HVAC equipment and large equipment loads will be served at 480 volts, 3-phase. Lighting throughout the facility will be served at 277 volts, single phase. Office, laboratory and computer equipment, as well as general-purpose receptacle circuits will be served at 120 volts, single phase. All other equipment and devices will be served by the appropriate distribution system voltage.

Additional electrical distribution system details include the following:

- Transient voltage surge suppression (TVSS) equipment will be provided as required for sensitive equipment.
- Distribution system panelboards will make use of circuit breakers for overcurrent protection of feeders and branch circuits.
- Copper bussing will be provided for all electrical distribution system equipment.
- Separate panelboards will be used to support facility lighting and general-purpose electrical requirements.

Additional electrical service details will be developed as the design process continues. The electrical distribution system as described above will allow for the following:

- System capacity to accommodate present and future loads.
- Maximum flexibility to accommodate future building modifications.
- Efficient service to building lighting, equipment and HVAC loads.

Lighting Systems

Lighting systems throughout the addition will be designed in accordance with University design guidelines, IES recommendations and applicable energy codes. Occupancy/vacancy sensors will be used throughout most spaces in the addition to provide automatic off of lighting loads during unoccupied times. In general, lighting systems will be as follows:

- For laboratories it is critical to provide appropriate illumination levels on bench

tops, to minimize the impact of shadows created by equipment, casework and personnel, and to minimize the effects of direct and indirect glare on computer and equipment screens. In addition, it is imperative that labs be provided with lighting fixtures that can withstand environmental conditions in each space. Recessed, high efficient, linear, LED fixtures will be installed over the edge of the bench tops. This type of lighting provides adequate levels of illumination on bench tops, helps to minimize issues associated with glare and shadowing, while still providing illumination of vertical surfaces. Task and surgical lighting will be evaluated and, if deemed appropriate, provided in each laboratory according to direction provided by the users. Fixtures in new laboratory areas will be equipped with dimming to provide a variety of light levels. Fixtures in laboratories will be enabled by occupancy/vacancy sensors, and controlled locally within each space.

- Lighting in corridors will be provided by linear, 2’x 4’, 1’x4’ or 2’x2’, recessed, high efficiency, LED troffers, and downlight fixtures. A portion of these fixtures will utilize inverters to provide Code required emergency egress lighting and night lighting. All normal lighting fixtures will be enabled by occupancy sensors. Photosensor control of fixtures in the daylight zone will be incorporated where applicable.
- Recessed, lensed LED fixtures and/or LED downlights will be used to provide lighting in bathrooms and locker rooms. A portion of these fixtures will utilize inverters to provide Code required emergency egress lighting. Room occupancy sensors will be used to control all other fixtures. Dual technology occupancy sensors will be utilized in restrooms to provide automatic off.
- Lighting in the mechanical rooms, electrical rooms, telecommunication rooms, custodial rooms and storage areas will be provided by industrial type, LED fixtures. A portion of the fixtures located in these spaces will utilize inverters. Room occupancy sensors or digital time switches will be used to control fixtures in these spaces.

Receptacle Layouts

Receptacle layouts and circuiting to support computer equipment, laboratory equipment, telecommunications equipment and general purpose needs will be provided in accordance with direction provided by building users and University personnel.

Receptacles in raceway systems will be connected to alternate 20-amp branch circuits.

ELECTRICAL NARRATIVE, CONT.

Dedicated receptacles and circuits will be provided as required to support specific equipment locations throughout the renovated areas.

All electrical devices in laboratories will be labeled with the panel source and circuit number. All receptacle branch circuits will be provided with equipment ground conductors. All branch circuit wiring will be copper and will be installed in concealed raceway systems. Ground fault interrupting type receptacles will be provided in all Code required locations, and in all designated “wet” locations throughout the facility.

Telecommunications

The existing telecommunications system will be extended to meet the needs of the renovated areas. The routing and all requirements to extend the existing telecommunications system within the renovated areas will be coordinated with KUMC Telecommunications. Outlet boxes and raceway distribution systems will be provided to support the installation and distribution of the telecommunications cabling system. Telecommunications outlets will be provided at locations directed by University personnel. The entire distribution system will be designed in strict accordance with ANSI/TIA/EIA standards for Category 6 equipment and cabling.

Electrical Service to HVAC Equipment

Electrical service to HVAC equipment will be provided, as required. All necessary starters, disconnect switches, control devices and VFD connections will be provided to ensure a complete and functional system installation. All feeder and branch circuit-wiring to HVAC equipment will be copper, and will be routed in conduit. Conduits will be routed concealed wherever possible.

Special Systems

Electrical rough-ins, including necessary receptacles and circuits will be provided to support the installation of Audio/Visual equipment, Automated Entry Control and security systems as required. Anticipated security system device locations will be fully and completely coordinated with Campus personnel. All requirements will be coordinated with the users and the owner’s representatives.

Fire Alarm System

The existing fire alarm control system will be expanded to serve the areas of renovation. The system will be designed in accordance with all current codes and standards and will also satisfy all current accessibility guidelines.

SUMMARY OF NET ASSIGNABLE SQUARE FOOTAGE

Room No.	Room Name	Qty	NASF	Total NASF
1.0	ANATOMY AND SURGICAL SKILLS PROGRAM			
1.1	Teaching Laboratory Space			7,500
1.1.1	Anatomy Laboratory	3	1,260	3,780
1.1.2	Surgical Skills Laboratory	4	715	2,860
1.1.3	Surgical Skills Hybrid OR / Demonstration	2	355	710
1.1.4	Surgical Skills Control	1	150	150
1.2	Adjacent Laboratory Support			3,800
1.2.1	Shared Freezer Room	1	330	330
1.2.2	Anatomy Cold Room	1	150	150
1.2.3	Surgical Skills Cold Room	1	150	150
1.2.4	Tissue Prep	1	540	540
1.2.5	Sterilization	1	400	400
1.2.6	Mens Locker Room	1	700	700
1.2.7	Womens Locker Room	1	700	700
1.2.8	Laundry Room	1	150	150
1.2.9	Check-In	1	230	230
1.2.10	Informal Debrief	3	150	450
1.3	Semi-Adjacent Laboratory Support			8,360
1.3.1	Gathering / Pre-Function	1	1,500	1,500
1.3.2	Open Study	1	1,500	1,500
1.3.3	Classroom / Briefing	3	880	2,640
1.3.4	Large Debrief	2	330	660
1.3.5	Small Debrief	2	165	330
1.3.6	Anatomege	1	330	330
1.3.7	Equipment Storage	1	850	850
1.3.8	Freezers	1	400	400
1.3.9	Record Office	1	150	150
Total Net Square Feet				19,660

FOURTH FLOOR ANATOMY LABORATORY RENOVATION - COST DETAIL

Opinion of Probable Construction Cost

Project: KUMC Orr Major Renovation
By: The Clark Enersen Partners
Date: November 3, 2017
GSF: 18,485
(16,235 4th Floor + 2,250 Penthouse)

Item		Cost	Cost / GSF
General Construction			
Division 1	General Requirements	\$ 78,121	\$ 4.23
Division 2	Demolition & Site Repair	\$ 101,175	\$ 5.47
Division 3	Concrete	\$ 16,500	\$ 0.89
Division 4	Masonry	\$ 2,000	\$ 0.11
Division 5	Steel	\$ 147,900	\$ 8.00
Division 6	Carpentry	\$ 24,829	\$ 1.34
Division 7	Thermal And Moisture Protection	\$ 280,715	\$ 15.19
Division 8	Openings	\$ 49,720	\$ 2.69
Division 9	Finishes	\$ 446,930	\$ 24.18
Division 10	Specialties	\$ 182,400	\$ 9.87
Division 11	Equipment	\$ 634,500	\$ 34.33
Division 12	Furnishings	\$ -	\$ -
Division 13	Special Construction	\$ -	\$ -
Division 14	Conveying Equipment	\$ -	\$ -
Division 21	Fire Suppression	\$ 73,300	\$ 3.97
Division 22	Plumbing	\$ 200,000	\$ 10.82
Division 23	Heating Ventilating And Air Conditioning	\$ 1,225,000	\$ 66.27
Division 26	Electrical	\$ 400,000	\$ 21.64
Division 27	Telecommunications	\$ 44,000	\$ 2.38
Division 28	Electronic Safety And Security	\$ 63,000	\$ 3.41
Subtotal - General Construction Costs		\$ 3,970,090	\$ 215
Gen. Cond.	General Contractor General Conditions (5.0%)	\$ 198,505	\$ 10.74
OH&P	Contractor Overhead and Profit (10.0%)	\$ 416,859	\$ 22.55
Inflation	Construction Escalation (2%)	\$ 91,709	\$ 4.96
Contingency	Contingency (10%)	\$ 467,716	\$ 25.30
Soft Costs	Design Fees & Soft Cost Allowance (15%)	\$ 701,574	\$ 37.95
AV	Audio Visual Equipment Allowance	\$ 500,000	\$ 27.05
Total - General Construction Costs		\$ 6,346,454	\$ 343.33

FOURTH FLOOR ANATOMY & SURGICAL SKILLS RENOVATION - COST DETAIL

Opinion of Probable Construction Cost

Project: KUMC Orr Major Renovation
By: The Clark Enersen Partners
Date: November 3, 2017
GSF: 18,485
(16,235 4th Floor + 2,250 Penthouse)

Item		Cost	Cost / GSF
General Construction			
Division 1	General Requirements	\$ 84,371	\$ 4.56
Division 2	Demolition & Site Repair	\$ 101,175	\$ 5.47
Division 3	Concrete	\$ 16,500	\$ 0.89
Division 4	Masonry	\$ 2,000	\$ 0.11
Division 5	Steel	\$ 147,900	\$ 8.00
Division 6	Carpentry	\$ 31,579	\$ 1.71
Division 7	Thermal And Moisture Protection	\$ 286,115	\$ 15.48
Division 8	Openings	\$ 109,650	\$ 5.93
Division 9	Finishes	\$ 590,930	\$ 31.97
Division 10	Specialties	\$ 365,400	\$ 19.77
Division 11	Equipment	\$ 1,629,500	\$ 88.15
Division 12	Furnishings	\$ -	\$ -
Division 13	Special Construction	\$ -	\$ -
Division 14	Conveying Equipment	\$ -	\$ -
Division 21	Fire Suppression	\$ 73,300	\$ 3.97
Division 22	Plumbing	\$ 259,460	\$ 14.04
Division 23	Heating Ventilating And Air Conditioning	\$ 1,300,684	\$ 70.36
Division 26	Electrical	\$ 569,520	\$ 30.81
Division 27	Telecommunications	\$ 64,940	\$ 3.51
Division 28	Electronic Safety And Security	\$ 71,000	\$ 3.84
Subtotal - General Construction Costs		\$ 5,704,024	\$ 309
Gen. Cond.	General Contractor General Conditions (5.0%)	\$ 285,201	\$ 15.43
OH&P	Contractor Overhead and Profit (10.0%)	\$ 598,922	\$ 32.40
Inflation	Construction Escalation (2%)	\$ 131,763	\$ 7.13
Contingency	Contingency (10%)	\$ 671,991	\$ 36.35
Soft Costs	Design Fees & Soft Cost Allowance (15%)	\$ 1,007,987	\$ 54.53
AV	Audio Visual Equipment Allowance	\$ 750,000	\$ 40.57
Total - General Construction Costs		\$ 9,149,888	\$ 494.99

Item #	Division	Comments	Quantity	Unit	Unit Cost	Amount	Total	Cost/GSF
DIVISION 1 - GENERAL REQUIREMENTS								
1	Temporary Heat		3	Months	\$ 5,000.00	\$ 15,000.00		
2	Temporary Utilities	Water, Gas and Electric by KUMC	0	Months	\$ 2,500.00	\$ -		
3	Job Site Fencing	Fencing and Construction Gates	150	LF	\$ 15.00	\$ 2,250.00		
4	Job Trailer		10	Months	\$ 5,000.00	\$ 50,000.00		
5	Truck Mounted Crane		2	Months	\$ 5,000.00	\$ 10,000.00		
6	Laydown Area		1	LS	\$ -	\$ -		
7	Traffic and Street Control		2	Months	\$ 1,250.00	\$ 2,500.00		
8	Waste Management and Disposal		0	LS	\$ -	\$ -		
9	Final Building Clean-Up		18,485	SF	\$ 0.25	\$ 4,621.25		
							\$ 101,175.00	\$ 5.47
DIVISION 2 - SITE WORK & DEMOLITION								
1	2A - Interior Demolition							
2	Interior Demolition	Includes walls, floor and ceiling finishes	16,235	SF	\$ 5.00	\$ 81,175.00		
3	2C - Site Repair							
4	Site Repair Upon Completion of Construction	Replace Materials Disturbed by Construction	1	LS	\$ 20,000.00	\$ 20,000.00		
							\$ 16,500.00	\$ 0.89
DIVISION 3 - CONCRETE								
1	3A - Concrete Slabs							
2	Housekeeping Pads		4	EA	\$ 3,500.00	\$ 14,000.00		
3	Misc. Patching		1	LS	\$ 2,500.00	\$ 2,500.00		
							\$ 2,000.00	\$ 0.11
DIVISION 4 - MASONRY								
1	4A - Unit Masonry							
2	Miscellaneous Masonry Patching	Allowance	1	LS	\$ 2,000.00	\$ 2,000.00		
							\$ 147,900.00	\$ 8.00
DIVISION 5 - STEEL								
1	5A - Structural and Miscellaneous Steel							
2	Structural Steel Columns		2	Ton	\$ 4,200.00	\$ 8,400.00		
3	Column Base Plates	Includes Graft Placement	9	EA	\$ 500.00	\$ 4,500.00		
4	Structural Steel Beams and Girders		10	Ton	\$ 3,750.00	\$ 37,500.00		
5	Steel Bracing Members		1	Ton	\$ 4,000.00	\$ 4,000.00		
6	Miscellaneous Steel Framing	Lighting Boom Supports	1	LS	\$ 20,000.00	\$ 20,000.00		
7	Miscellaneous Steel	Angles, Clips and Other Misc. Steel	1	LS	\$ 10,000.00	\$ 10,000.00		
8	5B - Steel Joists		0	Ton	\$ 2,750.00	\$ -		
9	5C - Steel Deck							
11	Steel Roof Deck	20 Gauge	2,250	SF	\$ 3.00	\$ 6,750.00		
12	5D - Steel Fabrications							
13	Ships Ladder to Mechanical Penthouse Roof		1	EA	\$ 7,500.00	\$ 7,500.00		
14	Miscellaneous Steel Fabrications	Allowance	1	LS	\$ 5,000.00	\$ 5,000.00		
15	5F - Cold Formed Steel Framing							
16	Exterior Steel Stud Framing	Includes Interior GFW and Sheathing	3,500	SF	\$ 12.50	\$ 43,750.00		
							\$ 31,579.75	\$ 1.71
DIVISION 6 - CARPENTRY								
1	6A - Rough Carpentry							
2	Rough Blocking and Nails	Allowance	1	LS	\$ 2,500.00	\$ 2,500.00		
3	Roof Parapets		192	LF	\$ 30.00	\$ 5,760.00		
4	Interior Wood Blocking	Allowance	16,235	LS	\$ 0.50	\$ 8,117.50		
5	6B - Finish Carpentry							
6	Finish Carpentry	Allowance	16,235	SF	\$ 0.50	\$ 8,117.50		
7	Architectural Woodwork	Allowance	16,235	SF	\$ 0.25	\$ 4,058.75		
8	Architectural Millwork	Non Laboratory Cabinetry	11	LF	\$ 275.00	\$ 3,025.00		
							\$ 286,115.00	\$ 15.48
DIVISION 7 - THERMAL AND MOISTURE PROTECTION								
1	7A - Waterproofing							
2	7B - Building Insulation							
3	7C - Metal Wall Panels	R-17 - Excludes Roofing Insulation	3,500	SF	\$ 4.00	\$ 14,000.00		
4	Metal Panel System		2,000	SF	\$ 40.00	\$ 80,000.00		
5	Integrated Metal Covers	All Metal Panel Locations	600	SF	\$ 10.00	\$ 6,000.00		
6	7D - Roofing Systems							
7	R-Flat Roofing System	White Including Insulation	4,000	SF	\$ 11.30	\$ 45,200.00		
8	Refinished Wall Cap		192	LF	\$ 40.00	\$ 7,680.00		
9	Roof Hatch		1	EA	\$ 4,000.00	\$ 4,000.00		
10	Roof Accessories		1	LS	\$ 5,000.00	\$ 5,000.00		
11	7E - Fireproofing and Firestopping	Equipment Support Allowance						
12	Sprayed-On Fireproofing	Columns	180	LF	\$ 40.00	\$ 7,200.00		
13	Sprayed-On Fireproofing	Beams	1,200	LF	\$ 22.50	\$ 27,000.00		
14	Sprayed-On Fireproofing	Composite Roof	0	SF	\$ 7.00	\$ -		
15	Penetration Fireproofing		1	LS	\$ 10,000.00	\$ 10,000.00		
16	7F - Joint Sealant and Joint Covers							
17	Joint Sealant	Allowance	18,485	SF	\$ 1.00	\$ 18,485.00		
							\$ 109,650.00	\$ 5.93
DIVISION 8 - OPENINGS								
1	8A - Doors and Hardware							
2	Hollow Metal Frames	Single	25	EA	\$ 340.00	\$ 8,500.00		
3	Hollow Metal Frames	Pair	5	EA	\$ 400.00	\$ 2,000.00		
4	Wood Doors	Single	25	EA	\$ 550.00	\$ 13,750.00		
5	Wood Doors	Pair	5	EA	\$ 970.00	\$ 4,850.00		
6	Door Hardware	Per Leaf	50	EA	\$ 1,250.00	\$ 62,500.00		
7	Sliding Glass Doors and Frames	Including Frame and Hardware	3	EA	\$ 10,000.00	\$ 30,000.00		
8	Card Access	Included in Electrical Estimate	0	EA	\$ 4,500.00	\$ -		
9	8B - Glass and Windows							
10	Interior Hollow Metal Frame Windows		170	SF	\$ 40.00	\$ 6,800.00		
							\$ 590,929.50	\$ 31.97
DIVISION 9 - FINISHES								
1	9A - Wall Construction							
2	5 Star - Acoustic Board Wall Partitions	Includes Acoustical Bulbs	12,699	SF	\$ 9.00	\$ 114,291.00		
3	9B - Ceiling Finishes							
4	Acoustical Panel Ceiling		12,636	SF	\$ 4.00	\$ 50,544.00		
5	Drywall Ceilings	Includes Painted Finish	2,599	SF	\$ 10.00	\$ 25,990.00		
6	Drywall Soffits and Bulkheads	Allowance	1	LS	\$ 10,000.00	\$ 10,000.00		
7	9C - Wall Finishes							
8	Paint		21,898	SF	\$ 1.25	\$ 27,372.50		
9	Ceramic Tile		3,500	SF	\$ 8.00	\$ 28,000.00		
10	Miscellaneous Wall Finishes	Allowance	1	LS	\$ 5,000.00	\$ 5,000.00		
11	9D - Floor Finishes							
12	Carpet		0	SY	\$ 45.00	\$ -		
13	Porcelain Tile		1,200	SF	\$ 17.50	\$ 21,000.00		
14	Seamless Sheet Vinyl		0	SF	\$ 12.50	\$ -		
15	Epoxy Flooring		14,435	SF	\$ 14.00	\$ 202,090.00		
16	Epoxy Penthouse Floor		2,250	SF	\$ 16.00	\$ 36,000.00		
							\$ 365,400.00	\$ 19.77
DIVISION 10 - SPECIALTIES								
1	10A - Visual Display Surfaces							
2	Marketersboards	Allowance	1	LS	\$ 3,500.00	\$ 3,500.00		
3	10B - Toilet Accessories							

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Item #	Division	Comments	Quantity	Unit	Unit Cost	Amount	Total	Cost/GSF
4	Toilet Partitions		0	EA	\$ 2,250.00	\$ -		
5	Unlaid Screens		0	EA	\$ 750.00	\$ -		
6	Mirrors		0	LS	\$ 1,000.00	\$ -		
7	Miscellaneous Accessories		0	LS	\$ 1,000.00	\$ -		
10C - Signage								
9	Building Signage	Allowance	1	LS	\$ 7,500.00	\$ 7,500.00		
10D - Lockers								
10	Full Height Lockers		0	EA	\$ 300.00	\$ -		
11	Half Height Lockers		320	EA	\$ 325.00	\$ 104,000.00		
10E - Moveable Partitions								
12	Vertical Lift Partitions		0	LS	\$ 35,000.00	\$ -		
13	Sliding Partition	Located in Surgical Skills (Hulcor)	8	EA	\$ 30,000.00	\$ 240,000.00		
10F - Fire Prevention								
14	Fire Rating Upper Cabinets		4	EA	\$ 600.00	\$ 2,400.00		
10G - Miscellaneous Accessories								
15	Corner Guards	Allowance	1	LS	\$ 7,500.00	\$ 7,500.00		
16	Coat Rods and Hooks	Allowance	1	LS	\$ 500.00	\$ 500.00		
							\$ 1,429,500.00	\$ 88.15
DIVISION 11 - EQUIPMENT								
11A - Laboratory Casework								
2	Base Cabinets	Stainless Steel	88	LF	\$ 1,000.00	\$ 88,000.00		
3	Upper Cabinets	Stainless Steel	88	SF	\$ 750.00	\$ 66,000.00		
4	Tall Cabinets	Stainless Steel	90	LF	\$ 1,250.00	\$ 112,500.00		
5	Laboratory Benches	Stainless Steel	120	LF	\$ 200.00	\$ 24,000.00		
6	Moveable Laboratory Tables	Stainless Steel 2 x 2	18	EA	\$ 750.00	\$ 13,500.00		
11B - Environmental Rooms								
7	Cadaver Freezer		300	SF	\$ 375.00	\$ 112,500.00		
8	Cadaver Cooler		300	SF	\$ 325.00	\$ 97,500.00		
9	Cadaver Storage Racks		6	EA	\$ 7,500.00	\$ 45,000.00		
11C - Gross Anatomy Equipment								
10	Gross Anatomy Tables	Three of the Tables are for Instructors	33	EA	\$ 3,800.00	\$ 125,400.00		
11	Video Monitors		30	EA	\$ 1,500.00	\$ 45,000.00		
12	Large Display Video Monitors	Behind Instructors Tables	3	EA	\$ 7,500.00	\$ 22,500.00		
13	Anatomy Booms	Lights and AV Integration	33	EA	\$ 7,500.00	\$ 247,500.00		
11D - Surgical Skills Equipment								
14	Surgical Tables		18	EA	\$ 5,000.00	\$ 90,000.00		
15	Surgical Booms	Lights and AV Integration	18	EA	\$ 25,000.00	\$ 450,000.00		
11E - Sterilization Equipment								
16	Sterilizer		1	EA	\$ 25,000.00	\$ 25,000.00		
17	Autoclave		1	EA	\$ 75,000.00	\$ 75,000.00		
							\$ -	\$ 0.00
DIVISION 12 - FURNISHINGS								
12A - Window Coverings								
2	Roller Window Shades		0	SF	\$ 12.00	\$ -		
							\$ -	\$ 0.00
DIVISION 13 - SPECIAL CONSTRUCTION								
No Work								
DIVISION 14 - CONVEYING EQUIPMENT								
No Work								
							\$ -	\$ 0.00
DIVISION 21 - FIRE SUPPRESSION								
							\$ 73,300.00	\$ 3.97
1	Wet-Pipe Sprinkler and Standpipe System		1	LS	\$ 73,300.00	\$ 73,300.00		
DIVISION 22 - PLUMBING								
							\$ 259,460.00	\$ 14.04
1	Plumbing, Venting and Equipment		1	LS	\$ 259,460.00	\$ 259,460.00		
							\$ 1,300,684.00	\$ 70.34
DIVISION 23 - HEATING VENTILATING AND AIR CONDITIONING								
1 Mechanical Demolition								
1	AS Systems		1	LS	\$ 25,000.00	\$ 25,000.00		
2	Plumbing Systems		1	LS	\$ 742,233.00	\$ 742,233.00		
3	Controls		1	LS	\$ 263,814.00	\$ 263,814.00		
11	Controls		1	LS	\$ 250,847.00	\$ 250,847.00		
							\$ 569,570.00	\$ 30.81
DIVISION 24 - ELECTRICAL								
1	Electrical Demolition		1	LS	\$ 20,000.00	\$ 20,000.00		
2	Service and Distribution		1	SF	\$ 12.00	\$ 194,890.00		
3	Lighting		16,235	SF	\$ 12.00	\$ 194,820.00		
4	Branch Circuit Distribution		16,235	SF	\$ 8.00	\$ 129,880.00		
6	Mechanical Equipment Connection		5	EA	\$ 10,000.00	\$ 50,000.00		
							\$ 44,940.00	\$ 3.51
DIVISION 27 - COMMUNICATIONS								
1	Telecommunications		16,235	SF	\$ 4.00	\$ 64,940.00		
							\$ 71,000.00	\$ 3.84
DIVISION 28 - ELECTRONIC SAFETY AND SECURITY								
1	Fire Alarm System		1	LS	\$ 20,000.00	\$ 20,000.00		
2	Card Access		8	EA	\$ 4,500.00	\$ 36,000.00		
3	Security		1	LS	\$ 15,000.00	\$ 15,000.00		

FOURTH FLOOR ANATOMY LABORATORY RENOVATION - DESIGN & CONSTRUCTION SCHEDULE



The University of Kansas
KUMC ORR Major Surgical Skills and Anatomy Laboratory Renovation
Project Schedule

LEGEND

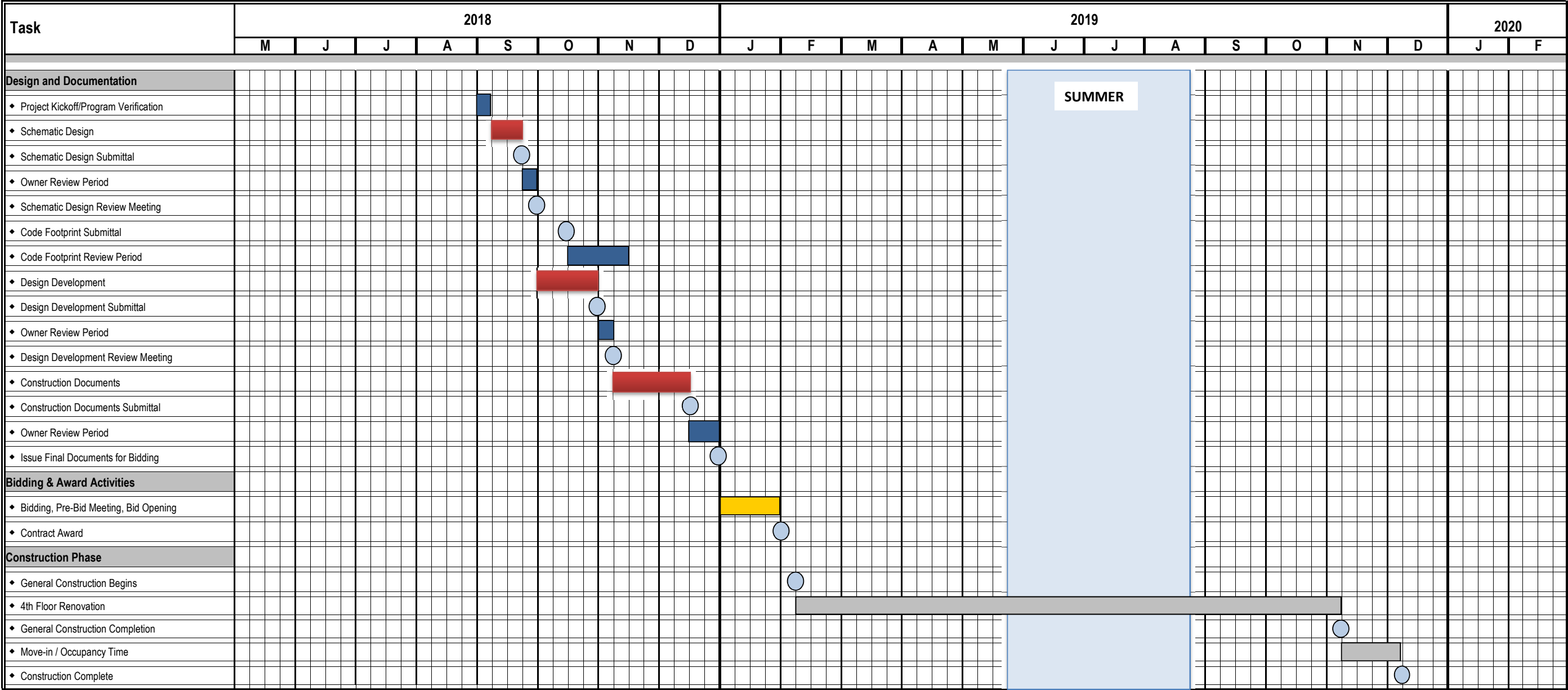
Milestone & Meeting Dates

Design & Documentation

Bidding

Construction

Owner Review



FOURTH FLOOR ANATOMY & SURGICAL SKILLS RENOVATION - DESIGN & CONSTRUCTION SCHEDULE



The University of Kansas
KUMC ORR Major Surgical Skills and Anatomy Laboratory Renovation
Project Schedule

LEGEND

Milestone & Meeting Dates

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